

WHAT IS CLAIMED IS:

1           1. A method for generating biomarkers specific for a known genus, species, or strain  
2 of a bioorganic compound selected from the group consisting of filamentous fungi, yeasts,  
3 molds, toxins of fungi, and pollen comprising:

4           (a) providing a sample comprising a known genus, species or strain of the bioorganic  
5 compound;

6           (b) placing an aliquot of said sample into a mass spectrometer;

7           (c) subjecting the sample to an ion source to produce charged molecular ions;

8           (d) propelling the ions into a mass analyzer to obtain a mass spectra;

9           (e) repeating steps (a)-(d) with at least one other non-identical sample comprising the  
10 same genus, species or strain of bioorganic compound;

11           (f) comparing the mass spectra obtained for each sample;

12           (g) identifying at least one peak on the spectra that is common to each sample; and

13           (h) assigning an m/z measurement of the peak as a genus, species, or strain specific  
14 biomarker.

1           2. The method according to claim 1 wherein the mass spectrometer is selected from  
2 the group consisting of linear or non-linear reflectron time-of-flight, single or multiple  
3 quadrupole, single or multiple magnetic sector, fourier transform ion cyclotron resonance, ion  
4 trap and combinations thereof.

1           3. The method according to claim 1 wherein the ion source is selected from the group  
2 consisting of laser desorption, fast atom bombardment, plasma desorption, electrospray  
3 ionization, or massive cluster impact.

1           4. The method according to claim 1 wherein the mass spectrometer is a time-of-flight  
2 mass spectrometer.

1           5. The method according to claim 4 wherein matrix assisted laser desorption  
2 ionization is used as the ion source.

- 1           6. The method according to claim 5 comprising the steps of:  
2           (a) mixing a sample comprising a suspension of known genus, species or strain of the  
3 bioorganic compound with a matrix solution to generate a sample mixture;  
4           (b) placing the aliquot of said sample mixture on the probe tip of the time-of-flight  
5 mass spectrometer and allowing it to dry;  
6           (c) irradiating the dried aliquot with pulsed laser radiation to form charged molecular  
7 ions;  
8           (d) accelerating the charged molecular ions by an electric field toward a detector  
9 through the flight tube of the time-of-flight mass spectrometer to obtain a mass spectra;  
10          (e) averaging the mass spectra resulting from 10 to 500 laser pulses;  
11          (f) repeating steps (a)-(e) with at least one other, nonidentical bioorganic compound  
12 comprising a suspension of the same genus, species or strain;  
13          (g) comparing the averaged mass spectra obtained for each bioorganic compound;  
14          (h) identifying at least one peak that is common to each bioorganic compound; and  
15          (i) assigning an  $m/z$  measurement of the peak as a genus, species, or strain specific  
16 biomarker.
- 1           7. The method of claim 6 wherein the matrix solution comprises one or more organic  
2 acids in an aqueous solvent solution.
- 1           8. The method of claim 7 wherein the organic acids are selected from the group  
2 consisting of 3,5-dimethoxy-4-hydroxycinnamic acid,  $\gamma$ -cyano-4-hydroxycinnamic acid and  
3 *trans*-4-hydroxy-3-methoxycinnamic acid.
- 1           9. The method of claim 7 wherein the aqueous solvent solution is an organic solvent  
2 selected from the group consisting of nitrites, alcohols, ethers, water and mixtures thereof.
- 1           10. The method of claim 7 wherein the organic acids are selected from the group  
2 consisting of 3,5-dimethoxy-4-hydroxycinnamic acid,  $\gamma$ -cyano-4-hydroxycinnamic acid and  
3 *trans*-4-hydroxy-3-methoxycinnamic acid and the aqueous solvent solution is an organic  
4 solvent selected from the group consisting of acetonitrile, alcohols, water and mixtures  
5 thereof.

1 11. The method of claim 7 wherein the matrix solution further comprises aqueous  
2 trifluoroacetic acid.

1 12. The method of claim 10 wherein the organic acid and organic solvent are added in  
2 a ratio from about 70/30 (v/v) to about 30/70 (v/v).

1 13. The method of claim 6 wherein the pulsed laser radiation is provided by a 337nm  
2 nitrogen laser.

1 14. The method of claim 6 wherein about 10 to about 100 spectra are averaged.

1 15. A method for determining the genus, species and/or strain of an unknown  
2 bioorganic compound which comprises:

3 (a) generating a mass spectrum of the unknown bioorganic compound according to  
4 steps (a)-(d) of claim 1; and

5 (b) comparing the mass spectrum of the unknown bioorganic compound to a plurality  
6 of genus, species or strain specific biomarkers, said biomarkers being generated according to  
7 claim 1.

1 16. A method for determining the genus, species and/or strain of an unknown  
2 bioorganic compound which comprises:

3 (a) generating a mass spectrum of the unknown bioorganic compound according to  
4 steps (a)-(e) of claim 6; and

5 (b) comparing the averaged mass spectrum of the unknown bioorganic compound to a  
6 plurality of genus, species or strain specific biomarkers, said biomarkers being generated  
7 according to claim 6.

1 17. The method of claim 16 wherein the matrix solution comprises one or more  
2 organic acids in an aqueous solvent solution.

1 18. The method of claim 17 wherein the organic acids are selected from the group  
2 consisting of 3,5-dimethoxy-4-hydroxycinnamic acid,  $\gamma$ -cyano-4-hydroxycinnamic acid and  
3 *trans*-4-hydroxy-3-methoxycinnamic acid and the aqueous solvent solution is an organic  
4 solvent selected from the group consisting of nitrites, alcohols, ethers, water and mixtures  
5 thereof.

1 19. The method of claim 18 wherein the matrix solution further comprises aqueous  
2 trifluoroacetic acid.

1 20. The method of claim 16 wherein the pulsed laser radiation is provided by a 337nm  
2 nitrogen laser.

1 21. The method of claim 16 wherein about 10 to about 100 spectra are averaged.

1 22. A biomarker library for identifying the genus, species and/or strain of an unknown  
2 bioorganic compound selected from the group consisting of filamentous fungi, yeasts, molds,  
3 toxins of fungi, and pollen, the library comprising genus, species or strain specific biomarkers  
4 for known bioorganic compounds generated by the method of claim 1.

1 23. A biomarker library for identifying the genus, species and/or strain of an unknown  
2 bioorganic compound selected from the group consisting of filamentous fungi, yeasts, molds,  
3 toxins of fungi, and pollen, the library comprising genus, species or strain specific biomarkers  
4 for known bioorganic compounds generated by the method of claim 6.

1 24. The library of claim 22 wherein the genus, species and/or strain of fungi used is  
2 selected from the group consisting of *Phycomycetes*, *Ascomycetes*, *Neurospora*, *Aspergillus*,  
3 *Penicillium*, *Basidiomycetes*, *Deuteromycetes*, *Acremonium spp.*, *Alternaria spp.*, *Arthrrium*  
4 *spp.*, *Aureobasidium spp.*, *Beauveria spp.*, *Bipolaris spp.*, *Borytis spp.*, *Chaetomium spp.*,  
5 *Chrysonilia spp.*, *Cladosporium spp.*, *Cunninghamella spp.*, *Curvularia spp.*, *Drechslera*  
6 *spp.*, *Emmonsia spp.*, *Epiccoccum spp.*, *Fusarium spp.*, *Humicola spp.*, *Microsporum spp.*,  
7 *Mucor spp.*, *Myceliophthora spp.*, *Paecilomyces spp.*, *Pithomyces spp.*, *Rhizomucor spp.*,  
8 *Rhizopus spp.*, *Scopulariopsis spp.*, *Thielavia spp.*, *Trichoderma spp.*, *Ulocladium spp.* and  
9 *Verticillium spp.*

1 25. The library of claim 22 wherein the pollen used is selected from the group  
2 consisting of *Sorghum spp.*, *Secale spp.*, *Poa spp.*, *Cynodon spp.*, *Dactylis spp.*, *Agrostis spp.*,  
3 *Zea spp.*, *Ulmus spp.*, *Juglans spp.*, *Populus spp.*, *Juniperus spp.*, *Fraxinus spp.*, *Betula spp.*,  
4 *Alnus spp.*, *Acer spp.*, *Kochia spp.*, *Iva spp.*, *Artemisia spp.*, and *Ambrosia spp.*